tions on the Atlantic—there being observed no rigorous correspondence between the average direction of the movement of storm-centres and the prevailing wind; but that in some regions the average course of storm-centres is more northerly than that of the wind, and in some regions more southerly.

While in middle latitudes the generally progressive movement of cyclones is in an easterly direction, cyclonic areas are occasionally observed, both in Europe and America, advancing to westward. After a careful investigation of forty-one of the most decided cases which have occurred of these westerly movements of cyclones, it is considered that the following conclusions are warranted—viz. that the westerly movement of low-pressure centres is due to a fall of rain or snow, in most cases unusually great, in the region towards which the low centre advances; and the influence of one low-pressure area acting apparently as an attractive force upon another adjacent low-pressure area; to the influence exerted by two areas of high pressure, not far apart, by which a new movement is imparted to the air included between them, a new low centre being sometimes developed; or to the influence of a high pressure on the north-east side of a low-pressure area, when the gradients on the south-west side of the low area are slight, in which case the centre of the low-pressure area may be crowded towards the south-west.

Rate of Progress of Cyclones.—The rate of progress of the United States storms for thirteen years has been calculated, and the results arranged according to the months, and expressed in miles per hour. The average rate of progress for the year is 28·4 miles, rising to the maximum, 34·2 miles in February, and falling to the minimum, 22·6 miles, in August. As regards different years, the variation is also much greater in the winter than in the summer months. Thus, in November, 1878, the rate was 21·2 miles per hour, but in the same month of the following year it was 40·7 miles; and, on the other hand, in July, 1882, the rate was 19·8 miles, but in July, 1881, it was 26·6 miles—the difference between the extremes of November being thus 19·5 miles, and in July only 6·8 miles.

In Europe during the five years ending 1880 the mean annual rate of progress was 16·7 miles, rising to the maximum, 19·0 miles, in October, and falling to the minimum, 14·0 miles, in August. Hence the onward movement of storms in the United States is two-thirds greater than in Europe, the rate of excess for the United States over Europe being 1·9 in winter, and 1·5 in summer. On the mean of the year the average onward movement of storms is, in miles per hour, 28·4 for the United States, 18·0 for the middle latitudes of the Atlantic, 16·7 for Europe, 14·7 for the West Indies, and 8·5 for the Bay of Bengal and the China Sea.

Prof. Loomis is led to conclude that the general system of atmospheric circulation, consisting of the trades of equatorial regions and the westerly winds of the middle latitudes, is the primary cause which determines both the direction and velocity of the movement of storm centres; but as respects each individual storm, the determining cause is not so much the average system of atmospheric circulation, as the general movement of the atmosphere going on at the time, and in the vicinity of that particular storm. The influence of this general movement is, moreover, materially modified by a variety of causes, among which may be enumerated the rainfall, and the position of the region over which it falls with respect to the centre of the storm; the size and position of neighbouring areas of high and low pressure, the distribution of temperature, and the physical configuration and character of the surface.

In further prosecuting this important discussion, the time has perhaps now come for meteorologists to give more consideration and weight to the physical conditions of the cyclone, more particularly to the method of distribution of temperature and aqueous vapour within and in the more immediate neighbourhood of the cyclone. This point, which was so strongly dwelt on and urged by Dove, has for some time past been allowed to fall too much into the background. A cyclone is not merely a system of low pressure with winds all around blowing vorticosely inwards upon the centre; but it is further distinguished by this, that the atmosphere in front of its path is relatively warm and moist, and in the rear cold and dry. These features are seldom kept so steadily in view by meteorologists as they ought to be in the discussion of such questions as Prof. Loomis has here brought under review.

One outstanding difference of the storms of America and those of Europe is that nearly all of the American storms originate on the continent, not far from the Rocky Mountains, whereas the storms of Europe originate mostly on the ocean. It is not improbable that more than one of the important points of difference between these two classes of storms shown by Prof. Loomis have their explanation in the different conditions under which they have their origin.

OUR BOOK SHELF

A Treatise on the Calculus of Variations. By L. B. Carll, A.M. (London: Macmillan, 1885.)

A Text-Book on the Method of Least Squares. By Mansfield Merriman. (London: Macmillan, 1885.)

BOTH these works by American mathematicians have been, we believe, printed in America, and are now introduced to the attention of English students by Messrs. Macmillan. They are first-class representatives of the good work now being done in this field: we have (NATURE, vol. xvi. p. 21, vol. xxvi. p. 59) already given account of other American mathematical publications.

Mr. Carll, on his title page, states that his treatise is "arranged with the purpose of introducing, as well as illustrating, its principles to the reader by means of problems, and designed to present in all important particulars, a complete view of the present state of the science." The subject is one which certainly has not engaged the time of our book-compilers, for which good and sufficient reasons might be assigned. In 1810, as Todhunter writes, a work was published by Woodhouse, which has obtained a high reputation for accuracy and clearness. That work was not followed by any systematic treatise in English until the year 1850, when Mr. Jellett brought out his valuable "Elementary Treatise on the Calculus of Variations," an octavo volume of 377 pages, with an introduction of 20 pages. In the later editions of Mr. Todhunter's integral calculus are given such portions of the subject as are generally read by students. The same writer's "History" and "Researches" should be in the hands of all who desire to get up this branch thoroughly. After the lapse of so long an interval as thirty-five years

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we are not surprised to find that Jellett's work is difficult of access to general readers, and on this ground, if on no other, we welcome the present attempt to bring the "Calculus" to the fore again. The author follows Airy and Todhunter in the view he takes of a variation, and Jellett and Strauch in the treatment of varying functions, but he has not neglected to give fairly full accounts of the conceptions and methods of other writers.

A good deal of the preface is taken up with details which might well be omitted should the work reach a second edition, as we hope it may.

There are in all five chapters (568 and xvii. pages) printed in good type and in excellent style.

Chapter i., maxima and minima of single integrals, involving one dependent variable is broken up into ten sections: Chapter ii., maxima and minima of single integrals involving two or more dependent variables in two sections: Chapter iii., maxima and minima of multiple integrals in six sections. Chapter iv., applications to determining the conditions which will render a function integral one or more times in two sections.

Chapter v. gives a historical sketch of the rise and progress of the calculus of variations founded upon Todhunter's "History," and closes with an account of the "Researches in the Calculus of Variations," referred to above.

We have nothing to say of Mr. Merriman's work in addition to what we have said already (NATURE, vol. xxx. p. 334): the works are identical, except in the title pages.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

Italian Aid to Biological Research

THE Committee appointed by the Royal Academy of the Lincei in Rome at the request of H.E. the Minister of Naval Affairs, to see that the best possible use in the interests of science be made of the natural history specimens collected by officers of the Royal Italian Navy, wishes to make known to all students of biology that rich material for study, consisting of a certain number of plants and extensive collections of animals of nearly all classes, is at present deposited at the Zoological Station at Naples. This material has all been collected by the officers of the Royal Navy, principally by the *Vittor Pisani* in a recent voyage round the world, and by other Italian men-of-war in the Red Sea and the Ægean Sea. These collections have been preserved by the best and most modern methods, and can be used for histological and morphological researches, in accordance with the actual requirements of science, as well as for systematic and faunistic investigations. The Committee places this rich material at the disposal of the men of science of all countries who will ask to take part in its illustration, either to complete monographs in course, or for monographical works or for special research on any organic system of a given group.

The requests, on which the Committee will decide, are to be sent to Prof. Trinchese, University of Naples.

Prof. TRINCHESE, Naples
Prof. TODARO, Rome
Prof. PASSERINI, Parma
Prof. GIGLIOLI, Florence
Lieutenant CHIERCHIA (Royal Italian Navy), Naples
Prof. DOHRN, Naples

The Resting Position of Oysters

IN a letter from Mr. J. T. Cunningham in your impression of NATURE of October 22 (p. 597) it is sought to show that the oyster does not rest on its left but on its right valve. The evidence which appears to him conclusive on this question is "that the right flat valve is always quite clean, while the convex valve is covered with worm-tubes (*Stylea grossularia*) and Hydroids."

This observation is correct on the whole, but not decisive for the question under consideration. After reading Mr. Cunningham's letter I proceeded to examine 140 oysters in my collection of Schleswig oysters, and found only on a few right valves a worm (*Pomatoceros tricuspis*) or a Cirripede (*Balanus crenatus*), whereas on many *left* valves I distinguished sponges (*Halichondria panicea*), *Alcyonium digitatum*, Hydroids (*Sertularia argentea*, *Tubularia indivisa*, *Eadendrium rameum*), Bryozoa (*Alcyonidium gelatinosum*), *Balanus crenatus*, *Pomatoceros tricuspis*, or *Sabellaria anglica*. Of the 140 oysters examined 43 still bore on their shells the body on which as spawn they had reared themselves, namely pieces of oyster-shells, *Mytilus edulis*, *Mya arenaria*, *Mya truncata*, *Cardium edule*, or *Buccinum undatum*. All these adherent bodies were attached to the nucleus of the left valve, not one single piece to the nucleus of the right. And this is a circumstance decisive in the question raised by Mr. Cunningham. The places on the right valve, where living animals rest, did not stick close to fixed bodies, but the water flowed freely over them, thus admitting embryos to settle on them. The bottom of oyster banks is not a smooth surface, but is formed mainly of old oyster-shells on which many living oysters do not assuredly plant themselves closely and horizontally, but lie often obliquely. It is thus that Hydroids, Sponges, Alcyonium, and Alcyonidium, having settled on the right lower valve, are enabled to grow freely in the water and without let or hindrance develop to the length of four or five inches.

Kiel, October 31 KARL MÖBIUS

Universal Secular Weather Periods

I DO not want to pose as a statistical cycle-hunter, or to bolster up any mere apparent local periodicity of a certain meteorological element, but I wish to place before your readers the appended independent paragraphs from two journals, one on each side of the Atlantic, and to ask any unprejudiced person if we have not here some preliminary evidence (all the more valuable from its being so evidently incidental and unconscious) in favour of the march of certain secular weather areas, possibly connected with barometric waves, similar to those traced out by Messrs. Chambers and Pearson in India, across the Atlantic, from America to Europe.

I would not submit such slender evidence to criticism were it not that it concurs entirely with certain views put forward by myself in a recent paper in the Royal Meteorological Society's *Quarterly Journal*, on "The Height of the Neutral Plane of Pressure in India," and that I have long felt that the entire question demands attention both on scientific and economical grounds. Also both paragraphs include last year, thus bringing the apparent periodicity up to date.

Being at present fully engaged in two other branches of research, I am unable just now to take up this hopeful and important problem, but I would suggest that if we ever intend to forecast the *general character* of the weather of a season or year, which even in this country undergoes long periodic changes, during which it remains for weeks and months together of the same *type*, some such method as the following must be adopted:—

Annual and seasonal mean barometric charts must be constructed from records at principal stations in America, Europe, and Asia for the past fifty or sixty years, and from them barometric abnormals for each year, and for each season, must be calculated, and charted. An examination of these ought to throw great light on, if not to some extent solve, the question of the motion of the larger pressure areas which in turn guide and control the motion of the smaller diurnal systems. The work would, I admit, be one of some considerable magnitude, but surely it is one imperatively demanded in the interests of the science, besides being *a priori* likely to yield valuable results. It has long been a cherished idea of mine to endeavour to carry out the scheme myself, and it is only because I feel precluded from doing so at present by the pressure of other work that I throw out the suggestion for the benefit of any who feel disposed to take it up.

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